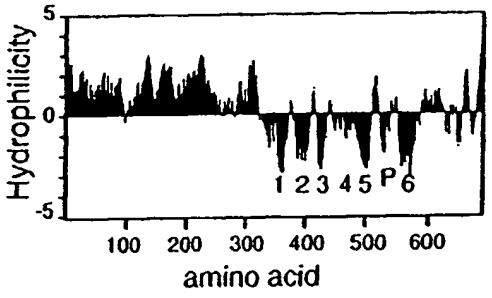
a

```
MDQSSRRDESYHETHPGSLDPSHQSHPHPHPHPTLHRPNQGGVYYDSPQH  50
GMFQQPYQQHGGFHQQNELQHLREFSDSHDNAFSHHSYQQDRAGVSTLPN 100
NISHAYGGSHPLAESQHSGGPQSGPRIDPNHHPHQDDPHRPSEPLSHPSS 150
TGSHQGTTHQQYHERSHHLNPQQNRDHADTISYRSSTRFYRSHAPFSRQE 200
RPHLHADHHHEGHHAHSHHGEHPHHKEQRHYHGDHMHHHIHHRSPSASQL 250
SEGEDHVQKRKKAQRAHKKAHTGNIFQLLWEKISHLLLGLQQMILSLTQS 350
                S1                                S2
LGFETFIFIVVCLNTVILVAQTFTELEIRGEWYFMVLDSIFLSIYVLEAV 400
                                  S3
LKLIALGLEYFYDPWNNLDFFIMVMAVLDFVLLQINSLSYSFYNHSLFRI 450
          S4                                    S5
LKVFKSMRALRAIRVLRRLSILTSLHEVAGTLSGSLPSITAILTLMFTCL 500
                                    P
FLFSVVLRALFQDSDPKRFQNIFTTLFTLFTMLTLDDWSLIYIDNRAQGA 550
                   S6
WYIIPILMIYIVIQYFIFLNLVIAVLVDNFQMALLKGLEKVKLEQAARVH 600
EKLLDDSLTDLNKADANAQMTEEALKMQLIEGMFGNMTVKQRVLHFQFLQ 650
LVAAVEQHQQKFRSQAYVIDELVDMAFEAGDDDYGK 686
```

b



c

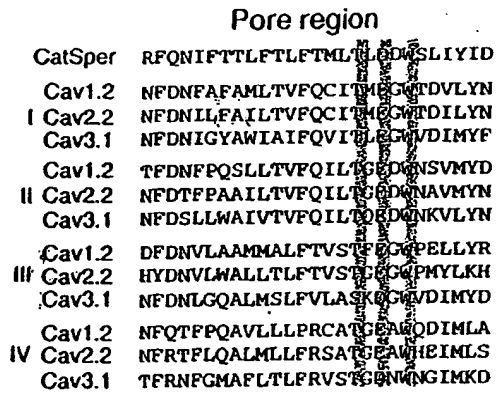


FIG. 1

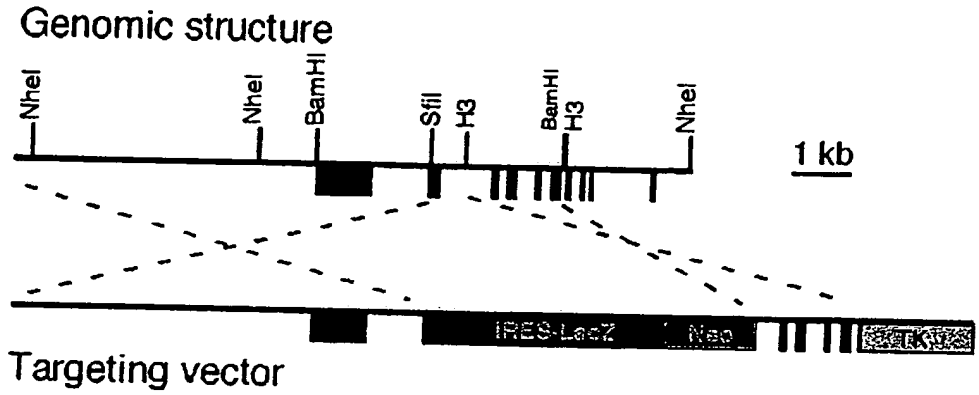
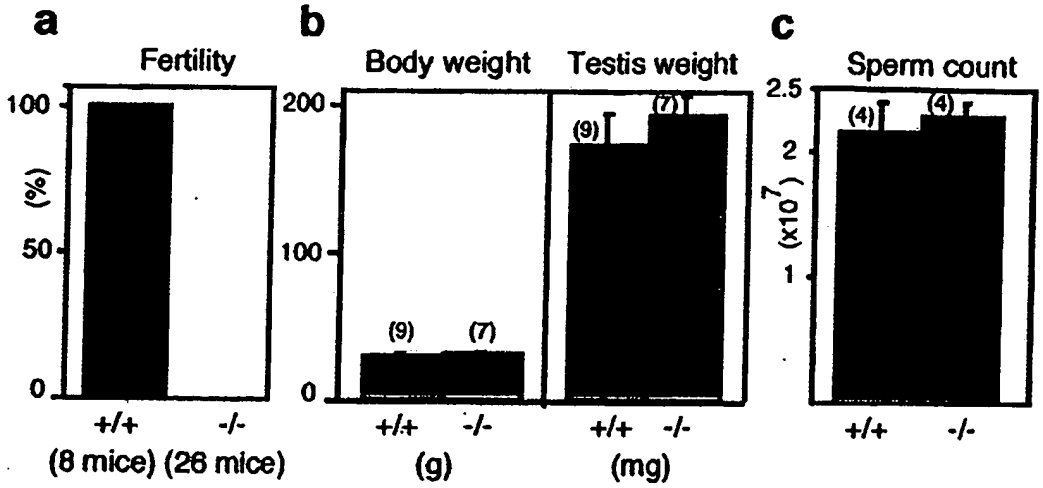

Genomic structure
NheI
NheI
BamHI
SfiI
H3
BamHI
H3
NheI
1 kb
IRES-LacZ
Neo
TK
Targeting vector

FIG. 2


a
Fertility
100
50
0
(%)
+/+
-/-
(8 mice) (26 mice)
b
Body weight
Testis weight
200
100
0
(9)
(7)
(9)
(7)
+/+
-/-
+/+
-/-
(g)
(mg)
c
Sperm count
2.5
2
1
(x10^7)
(4)
(4)
+/+
-/-

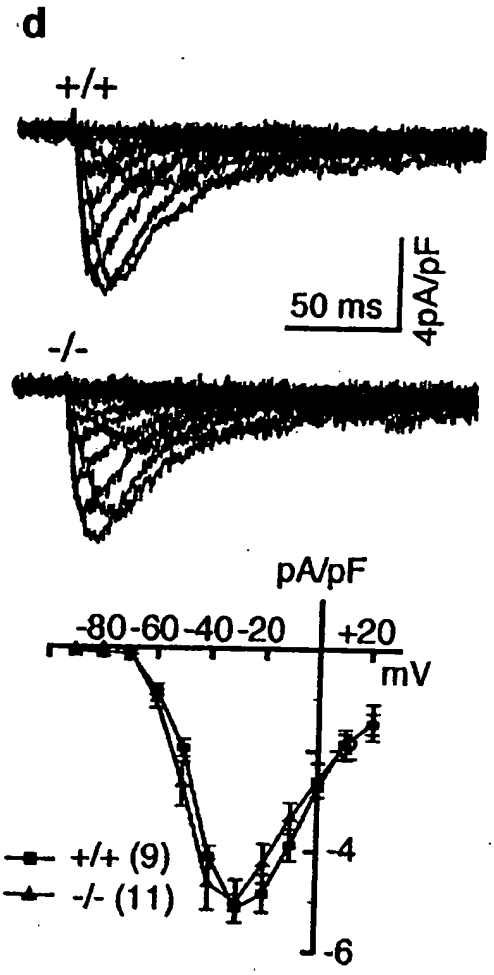

d
+/+
50 ms
4pA/pF
-/-
pA/pF
-80 -60 -40 -20
+20
mV
+/+ (9)
-/- (11)
-4
-6

FIG. 3

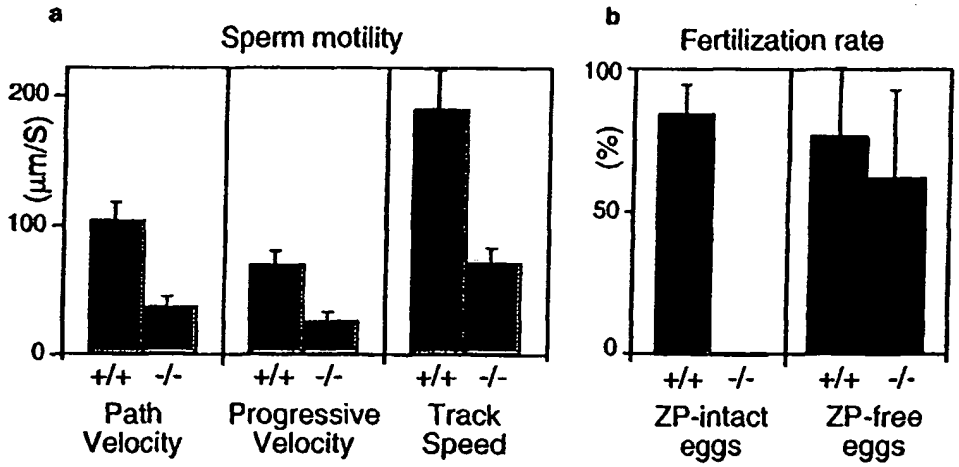

a
Sperm motility
200
100
0
(μm/S)
+/+ -/-
Path Velocity
+/+ -/-
Progressive Velocity
+/+ -/-
Track Speed
b
Fertilization rate
100
50
0
(%)
+/+ -/-
ZP-intact eggs
+/+ -/-
ZP-free eggs

FIG. 4

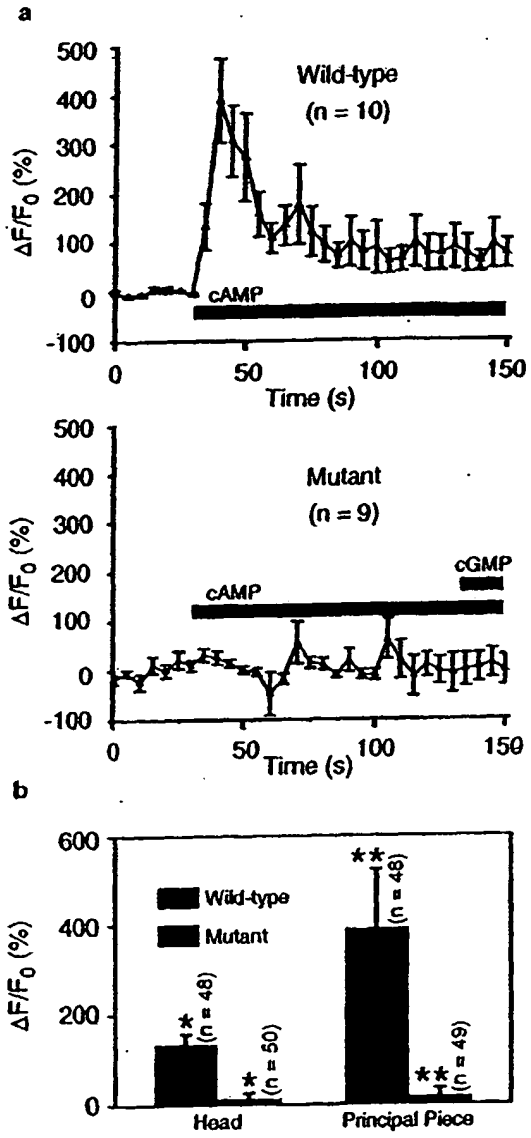

a
Wild-type
(n = 10)
cAMP
ΔF/F0 (%)
Time (s)
Mutant
(n = 9)
cAMP
cGMP
b
Wild-type
Mutant
Head
Principal Piece
(n = 48)
(n = 50)
(n = 48)
(n = 49)

FIG. 5